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glory of the Norwegian forests. Likewise, the fishing and general trade are essential to the life of the nation, and our author gives us a well-balanced story of these central elements of Norwegian geography.

Two physical chapters describe the "Fjords of the West Coast" and the "Fjelds and Mountain Valleys." Although the author concedes the pre-existence of river valleys in his references to the origin of the fjords, the general reader would gain an exaggerated impression of glacial erosion, as almost an exclusive agency in their making. The waters, lofty walls, the wealth of waterfalls, the lakes, farmsteads, hamlets and towns of the great fjords are truly and vividly described, accompanied, as are all the chapters, by very typical and satisfactory views. The general map of southern Norway, however, is unworthy of the volume, and should speedily be replaced by a good product of modern cartography.

In the account of Trondhjem Cathedral, the absence of any view of this great architectural monument of Norway marks an unfortunate omission. Other titles are,—"Bergen and the Hanseatic League," "Christiania," "Norse Letters and Henrik Ibsen," "Folk Music and Edvard Grieg"; and, "Painting, Sculpture and Architecture." Portraits are included of Haakon VII, Ibsen, Grieg, Nansen, Sinding, and of Mrs. Backer-Gröndahl. There is an appendix of suggestions to travellers, a bibliography and an index. A. P. B.

Worlds in the Making. The Evolution of the Universe. By Svante Arrhenius. Translated by Dr. H. Borns. xiv and 230 pp., and 60 illustrations. Harper & Bros., New York, 1908.

Dr. Arrhenius, director of the Physico-chemical Nobel Institute, Stockholm, is one of the greatest of physicists and chemists. In 1903, when he was 44 years old, he received the Nobel prize in the chemistry section and he had been Professor of Physics at Stockholm since his 36th year. His writings, on the scientific specialties he has made his own, command the serious attention of all workers in these fields. He published his "Lehrbuch der kosmischen Physik" (Treatise of Cosmic Physics) in 1903, and the explanations he tentatively offered of some cosmic phenomena involving great difficulties were very favourably received by his fellow students. This fact encouraged Dr. Arrhenius to submit his views to a wider circle of readers, and the present book is the successful result of this ambition. The volume is intended for popular reading and it will be welcomed by all intelligent readers who are interested in cosmical problems.

The book has to do with the evolution of the universe, and it differs much from many earlier works on this weighty problem because, in the past generation, the ascertained facts of chemistry as well as of astronomy have begun to be largely utilized in the study of the subject. Dr. Arrhenius assembles these facts, discusses them in relation to numerous phenomena and has happily brought recondite phases of his topic within the grasp of a large circle of readers.

He begins with what is nearest to us—some of the physical phenomena observable on our globe, and describes many of the phases of volcanic eruptions and earthquakes which have given us some knowledge of the interior of the earth. He concludes that "the solid earth crust cannot be very thick and that the core of the earth is probably gaseous." He thinks that the study of seismograms may help us to learn more about the central portions of the earth which, at first sight, appear to be absolutely inaccessible to scientific research.

In the second chapter, the author treats of celestial bodies as abodes of organisms. In this brief *résumé* of his book, it is impossible even to mention the groupings of many facts and their discussion. Allusion to some of the author's deductions is all that can be attempted. He thinks the assumption is plausible that organic life may thrive on Mars and also on a considerable part of the surface of Venus, particularly in the districts around the poles. "It is, however, rather sanguine to jump at the conclusion that the so-called canals of Mars prove its being inhabited by intelligent beings." Nevertheless, he does not think that Lowell's photographs warrant the opinion expressed by many persons, that the "canals" are optical illusions. The moons of Jupiter and Saturn may have, or have had, conditions suitable for the development of life. The author gives a most interesting account of the significance of carbon dioxide in the atmosphere; and though we lament the great waste of our coal resources and are terrified by the awful destruction of life and property by volcanic eruptions, there is comfort mixed with the evil:

> By the influence of the increasing percentage of carbonic acid in the atmosphere, we may hope to enjoy ages with more equable and better climates, especially as regards the colder regions of the earth, ages when the earth will bring forth much more abundant crops than at present, for the benefit of rapidly propagating mankind.

Much attention is naturally given to the radiation and constitution of the sun. The author concludes that we have every reason to presume that the sun's chemical energy will be sufficient to sustain the solar heat during many thousand millions, and possibly billions, of years to come. Several chapters are devoted to the stellar and nebular states of matter in the universe, including solar dust in the atmosphere and the non-luminous bodies that are probably diffused through space; also the polar lights and terrestrial magnetism. The concluding section, dealing with the way in which it is thought probable that life is spread through the universe is certain to interest every reader. The author summarizes earlier speculations on this subject, tells why there is good reason for dissenting from them, and asserts that recent discoveries of the effects of radiation and the universal acceptance of the theory of evolution have placed the question in a new and more favourable light.

The author agrees with Richter that organic life has always existed in the universe and has always propagated itself in the shape of living organisms from cells and from individuals composed of cells. It is probable that germs of the lowest organisms are continually being carried away, by electrical currents, against the force of gravity, from the earth and from other planets upon which they exist; and while most of them doubtless meet death in the cold of infinite space, yet a small number of the spores will fall on favourable soil in some other world and may there be able to spread life. According to this theory, "all organic beings in the whole universe should be related to one another and should consist of cells which are built up of carbon, hydrogen, oxygen and nitrogen."

The illustrations are instructive and the translation by Dr. Borns is beyond criticism.

São Paulo du Brésil. Notes d'un Colon Français. Par Louis Casabona. iv and 233 pp. and Illustrations. E. Guilmoto, Paris, 1908. Price, 3 frs.

The book is intended for Frenchmen who think of emigrating to São Paulo to engage in agriculture. It purports to be the notes of a French farmer, Léon Valade, who sold his little holding at home and emigrated with his family to São Paulo. The Immigration Bureau of the State gave him advice and material aid